

A nomenclatural and systematic note on the genus *Myiophagus* (ex Chytridiomycota)

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ABSTRACT

We reaffirm the opinion that the spelling of this fungal genus-name should be *Myiophagus*, not *Myrophagus*, and that correct authorship is *Myiophagus* Thaxter ex Sparrow, or simply *Myiophagus* Sparrow. Although two species have been published under *Myiophagus*—*M. ucrainicus* (M.C. Wize) Sparrow (upon which the genus was originally based), and *M. characeus* Kiran & Dayal—the propriety of inclusion of the latter species is uncertain (although it is here tentatively retained in the genus). Morphologically, placement of *Myiophagus* (based on *M. ucrainicus*) in the Blastocladiomycota seems most supportable, among several suggestions made for its classification. It is not clear, though, with which family (of Blastocladiales) *Myiophagus* has relationship. In any case, molecular data are essential to ultimate systematic decisions regarding the genus; interested investigators are encouraged to pursue study of *Myiophagus*—whenever it may be found again, collected and cultured. Published on-line www.phytologia.org *Phytologia* 102(1): 5-8 (March 22, 2020). ISSN 030319430.

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Sparrow (1939) described a new genus of Fungi, with posteriorly unflagellate zoospores, which he considered a Chytridiomycete; this organism occurred on certain dipteran pupae. Material examined by Sparrow had been collected by Dr. Roland Thaxter (in 1902) who made unpublished, descriptive notes on the specimens; this material (and information) was shown to Sparrow, in 1927, Thaxter encouraging Sparrow to pursue the project. Sparrow, unable to find additional specimens in the field, studied Thaxter's herbarium material, descriptive information, and drawings. Sparrow (1939) then validly published genus "*Myrophagus*"—purportedly using Thaxter's proposed spelling—generously (but mistakenly) crediting Thaxter (alone) with the *published* genus.

Sparrow (1939) noted that a similar organism (from generally similar substrates: larvae of kinds of beetles/weevils, in this case) had been described by M.C.Wize (1904) from the Ukraine (actually, the first published description of the organism, if only its resting spores, later to be called *Myiophagus*; Wize had referred it to genus *Olpidiopsis*). Regardless of size differences, Sparrow concluded the specimens seen by Wize and those seen by Thaxter represented the same taxon. Sparrow accordingly transferred Wize's species, "*Olpidiopsis ucrainica*," to "*Myrophagus*" as a new combination, *M. ucrainicus* (Wize) Sparrow (1939).

Torrey (1945) noted that Thaxter (in 1915) had shown him material of the "fly-inhabiting chytrid," which Torrey (1945) realized was the organism described by Sparrow (1939). Torrey indicated that he (Torrey) *correctly* copied, from Thaxter's 'script,' the name *Myiophagus*, not *Myrophagus*, the original notation (by Thaxter) seemingly not later preserved (cf. Torrey, 1945, p. 161, 2nd paragraph under '*Myiophagus*'). After studying the orthography of the name, Torrey concluded that Sparrow's (1939) spelling was in error, and effected change of the generic name to *Myiophagus*—not affecting Sparrow's (1939) authorship credit for the genus (cf. Art. 33.1, 33.2, 60.1; ICNAFP). One could argue (Art. 60.1) that the original spelling by Sparrow ('*Myrophagus*')—though less appropriate in meaning—could be retained, if not for the fact that Sparrow (1960) later employed (thereby *de facto* accepting) Torrey's orthographic correction to '*Myiophagus*.' Pursuant to Torrey's spelling change, virtually all authors eventually accepted '*Myiophagus*' (rather than '*Myrophagus*') as the correct spelling, including Karling

(1948, 1977), Fisher (1950), Muma and Clancy (1961), Dick (2001), James et al. (2014), and IF (*Index Fungorum*, current).

Authorship of *Myiophagus* has remained confusing, though. Sparrow (1939) incorrectly cited the genus in his validating publication as ‘*Myrophagus* Thaxter’ (Thaxter proposed, but did *not* publish, the genus). Pursuant to this, Fisher (1950) cited a ‘find’ of this organism as ‘*Myiophagus* sp. Thaxter.’ Karling (1977) and Dick (2001) noted authorship of *Myiophagus* as ‘Thaxter in Sparrow’—incorrect, since Thaxter did not publish *in* Sparrow (1939). Humber (2012) continued to list authorship as ‘*Myiophagus* Thaxter.’ *Index Fungorum* (IF) indicates authorship as ‘*Myiophagus* Thaxt. ex Sparrow’—essentially a correct citation, since Thaxter suggested the genus but it was Sparrow (1939) who validated it in publication (though introducing a misspelling). The name (authorship) should be cited ‘*Myiophagus* Thaxter ex Sparrow,’ or simply ‘*Myiophagus* Sparrow’—Sparrow being the sole publishing author (cf. Art. 46.7, ICNAFP).

Other than noting (Sparrow, 1939) that *Myiophagus ucrainicus* (zoospores posteriorly uniflagellate) could not be accepted in *Olpidiopsis* (zoospores laterally biflagellate)—where it was initially placed (M.C.Wize, 1904)—Sparrow was justifiably tentative about relationships of this “chytrid.” Sparrow mentioned possible connections to *Olpidium* and (perhaps oddly to) *Woronina*, or with *Micromyces* and *Synchytrium*; but, none of these suggestions were made with assurance. Though using a question-mark, Sparrow (1942) parenthetically listed “*Myrophagus*” under Olpidiaceae (Chytridiales). Karling (1948) explored the idea of relationship of *Myiophagus* within the Achlyogetonaceae (Chytridiales), particularly with *Septolpidium* (although thalli of *Septolpidium* do not form isthmuses; see below) or, perhaps less enthusiastically, with the Blastocladales. Karling (1977) became more open to the idea of relationship with Blastocladales, but nonetheless retained *Myiophagus* provisionally in the Achlyogetonaceae (Chytridiales). Relationships of *Myiophagus* remained uncertain; it was relegated (Dick, 2001) to a group of ‘Miscellaneous Genera’ of undetermined position. *Myiophagus* is placed in the Chytridiales in IF, no further relationship indicated. Uncertainty about morphological comparisons of *Myiophagus* (to potentially similar fungi) thus seems to persist. Whereas knowledge of life-cycle stages of *M. ucrainicus* has been pieced together by several investigators—the stages seemingly established—understanding of developmental biology of this organism could benefit from further study.

Although relationships of *Myiophagus* are unresolved, in illustrations by Karling (1948, 1977) of *M. ucrainicus* similarity to Blastocladales is evident. The presence in zoospores of *Myiophagus* of a grouping of apically positioned, small, non-refractive globules—or in some cases (Karling, 1977, p. 61, fig. 2) of an apparent nuclear-cap (above a rounded-triangular nucleus)—is suggestive of Blastocladiomycota. Zoospore-ultrastructure in this phylum is characteristic (James et al., 2014; Powell, 2016), featuring a nuclear-cap of ribosomes, a generally triangular nucleus, and a ‘side-body [organellar] complex.’ The mitotic figure in Karling (1977, fig. 14, p. 61)—showing intranuclear mitosis with a totally enclosed nuclear envelope—also suggests Blastocladiomycota (in contrast to Chytridiomycota where, in intranuclear mitosis, the nuclear envelope is open at the spindle poles, cf. Powell, 2016, p. 19). The thallus of *Myiophagus* (becoming catenulate, isthmuses connecting segments) and the ‘roughened-reticulate’ appearance of resting-spores (yellow- red- or orange-tinted, in powdery mass) are consistent with some members of this phylum. The classification of *Myiophagus* in Blastocladiomycota (Humber, 2012; James et al., 2014; Powell, 2016) thus appears correct. When young, the coenocytic thallus can resemble that of family Coelomomycetaceae. When older, the septate, catenated thallus is suggestive (save lack of rhizoids or rhizoid-like extensions) of thalli of the Catenariaceae. Molecular data would surely clarify potential relationships.

Myiophagus ucrainicus was initially considered rare, known just from material collected by Thaxter in 1902, and M. C. Wize (1904). However, additional collections mentioned—see, K. F. Wize (1929), Petch (1939, 1940), Waterson (1946), Fisher et al. (1949), Fisher (1950), Muma and Clancy

(1961), Karling (1948, 1977), Czeżuga and Godlewska (2001), and Czeżuga et al. (2003)—suggest broad distribution, though an organism probably no more than locally common. Karling (1948) discussed infestations (“chytridiosis”) of scale-insects, on citrus, in Florida by *Myiophagus*; possible application in biological control of scale-insects has been mentioned (e.g., Karling, 1948; Fisher, 1950; Powell, 2016). Humber (2012, p.158) noted occurrence of *Myiophagus* on “terrestrial insects,” indicating it is “rarely collected”—hence, ‘rarity’ may in part represent scant collecting. *Myiophagus* primarily infects insects (immature stages of Coleopterans, Dipterans and Homopterans). A report (not illustrated) from leeches in Poland (Czeżuga et al., 2003) suggests a wider range of invertebrate hosts; if confirmed as *Myiophagus*, one might wonder if this *possibly* represents an undescribed species.

Another species of *Myiophagus* has, in fact, been described—*M. characeus* Kiran & Dayal (1997), from India (found in the alga, *Chara*)—listed in IF, but not in Dick (2001). Descriptive information in Kiran and Dayal (1997) is relatively sparse; e.g., ‘planospores’ (zoospores) of ‘*M. characeus*’ (stated to be posteriorly uniflagellate) were not individually illustrated (no internal detail given), with little basis for comparison to zoospores of *M. ucrainicus*. Some sporangia of ‘*characeus*,’ unlike ‘*ucrainicus*,’ possess elongate discharge-tubes. The tubular, syncytial thallus (of ‘*characeus*’) becomes septate—this obscurely illustrated except for resultant(?), ‘*Olpidium*-like’ segments—but no catenation is evident. The smooth, rather thin-walled (sac-like) resting-spores of ‘*characeus*’ are quite unlike the thick, double-walled, reticulate resting-spores of ‘*ucrainicus*.’ The status of *M. characeus*, as a species of *Myiophagus*, would have to be regarded as somewhat questionable; there is, however, an apparent resemblance of this organism to *Septolpidium* (Achlygetonaceae, Chytridiomycota; Kiran and Dayal, in fact, appear to suggest relationship of *M. characeus* to Achlygetonaceae). Molecular sequence data could eventually resolve systematic placements of *M. ucrainicus* and *M. characeus*, and their possible relationship (if any) to one another. For now, we do not remove *M. characeus* from *Myiophagus*, in spite of rather striking differences from *M. ucrainicus*.

Taxonomic Summary of Genus *Myiophagus* (Blastocladiomycota): See full refs. in Lit. Cited.

Myiophagus R. Thaxter ex F. K. Sparrow (1939)—misspelled by Sparrow, *Myrophagus*, an orthographic error corrected to *Myiophagus* (Torrey, 1945; presently the accepted spelling). Herbarium collection = R. Thaxter #994, Kittery Point, Maine, 18 Sept., 1902—specimens at Farlow Herbarium, Harvard, and The University of Michigan Herbarium (MICH 334103). Full-plate **illustrations** of *Myiophagus* are **available** in Karling (1948, p. 248; and 1977, p. 61) and are not here reproduced.

M. ucrainicus (M.C. Wize) F.K. Sparrow (1939). Resting-spore photographs: Humber (2012, p.160).

Olpidiopsis ucrainica M. C. Wize (1904), original species; Ruthenian area, western Ukraine.

Entomophthora reticulata T. Petch (1939), Ingleborough, North Yorkshire, England.

M. characeus U. Kiran & R. Dayal (1997), Varanasi, India. Status uncertain (discussed above).

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